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Abstract

FUEL ELEMENTS STUDIES AT THE JUNTA DE ENERGIA NUCLEAR

J.D. Pedregal et al.
Junta de Energía Nuclear. Madrid

This paper describes the main lines of effort at the Metallurgy Division of the J.E.N. As far as core materials are concerned metallic uranium, uranium dioxide and uranium monocarbide production techniques have been developped. There is also small group working on the fabrication of aluminium clad fuel plates for the J.E.N. research reactors of Argonaut and swimming pool type.

Work on metallic uranium has covered the production of UF_4, preparation of uranium ingots by calcium reduction of uranium tetrafluoride and fabrication of uranium bars by vacuum casting and by extrusion. Some work has been also carried out on the effect of thermal and mechanical treatments on uranium bars and on the influence of minor alloying constituents.

Work on UO_2 has dealt with the preparation of suitable powders for sintering purposes and production of uranium monocarbide by corbothermic reduction of UO_2. Each one of this powders requires different properties. The effect of fabrication variables on the final characteristics of the powders have been evaluated.

Uranium carbide production by arc melting and casting has been studied. UC feed stock is prepared either from UO_2 or from uranium scrap from the machinning of uranium bars.

Work on aluminium clad fuel plates has been restricted to

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elements with U_3O_8 -Al dispersion cores.

Some effort has been spent on the preparation on refractory ceramic materials. Special type corrosive resistant to gaseous hydrofluoric acid ceramic materials have been developped.

Welding studies have been concerned mainly with aluminium and aluminium alloys, magnesium base alloys and stainless steel.

On the non destructive field X-ray and ultrasonic testing facilities are available. Work on eddy current methods is also in progress.

Hot cell laboratories will be in operation in 1964 - 65. They will include a 1.000 C cell and a line of lead shielded glove boxes.

All work at the Metallurgy Division of the J.E.N. is oriented towards the installation of complete fuel fabrication facilities whenever the reactor program will require it.

The paper describes the facilities available at present or in the near future with emphasis on the technical characteristics of the equipment and production capacity.